AM8040 Precision Thermometer
User's Guide

AccuMac

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Please read the "Important Notice" *information in the next page before turning on the power of this instrument!*

Important Notice ---- Warning

- **Check the position of "Measurement/Calibration Switch" on the rear panel. Please refer to Figure 2. The switch must be at measurement (left) position. Loss of calibration data will occur if the switch is at the calibration (CAL) position when the instrument is used in measurement application.**

- **The instrument is calibrated before shipment. Only qualified calibration professionals with proper standard resistors should perform the calibrations of this device. Please refer to** *4. General Operations*

AM8040 is a high accuracy digital thermometer working with a four-wire platinum resistance thermometer (PRT) sensor.

The details of AM8040 operations are shown as follows:

2.1. Connecting the probe/sensor

Four-wire sensor should be connected to the "Sensor" terminals at the rear panel. Figure 3 shows how the four wire sensor should be connected.

It should be noted that the "Measurement/Calibration" switch should be at "Measurement" position.

Measurement/Calibration Switch

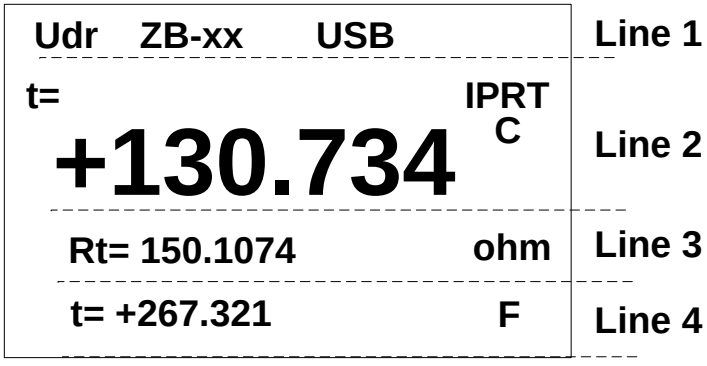
Figure 3: Rear Panel and Sensor Terminals

2.2. Instrument connection with AC power

AM8040 must work with power of AC100V~240V.

2.3. Instrument front panel display and touchpad

After power is on and a sensor is connected, AM8040 shows some initialization information, and then display information including the instrument's interface status, measured temperature in Celsius degree, the sensor resistance and temperature in Fahrenheit degree. These are shown in 4 lines as following figure.



There is a status sign which blinks at the upper left corner of the LCD display functioning as a status indicator. The status sign blinks when the device is powered on.

Line1 is the instrument's interface status, including USB flash drive, wireless communication status and USB to computer interface status. If "Udr" is displayed, it means that a flash flash drive is connected to the Host USB interface; if "ZB-xx" is displayed, where "xx" are numbers, it means Zigbee wireless data capturing is working; if the display shows "USB" on the top line, it informs the user that AM8040 is connected to a computer's USB interface.

The "t=" at Line2 shows the measured temperature of the sensor. The "IPRT" at the end of the Line2 tells the type of sensor of sensor. AM8040 supports two types of sensors. "SPRT" indicates a 25Ω or 100 Ω standard platinum resistance thermometers with α=0.003925. "IPRT" indicates a 100Ω industrial platinum resistance thermometer with α=0.00385. The "C" is displayed at end of Line2, it means the temperature is measured is in Celsius degree.

Line3 shows the sensor resistance. Line 4 shows the temperature in Fahrenheit degree.

AM8040 has three display pages of the measured data and these pages can be scrolled to show different information. The above sample is page1. The third page shows the resistance of the sensor. The second page is the combination of page1 and page3. User can scroll up and down these three pages by pressing or key.

The menu key and return/right shift key can be used for sensor selections and parameter adjustments. The flash drive recording start/stop key can be used for data saving to flash

drive. The details are in 5 Instrument Calibration and Accuracy Adjustment, and 6 Selection of Sensors and Adjustment of Parameters.

❖ Instrument Calibration *And Accuracy Adjustments*

1. Introduction

AM8040 precision thermometer is a desktop temperature measurement and calibration device. It can work together with various types of platinum resistance thermometer (PRT) sensors. The measured temperature is calculated by the embedded microcontroller following ITS-90 standard or CVD conversion method. This precision thermometer has strong data acquisition capability. Users can acquire and record data using an USB cable connecting to a PC, or using a Flash drive by simply 'plug-and-record'. Alternatively, it can work with an optional wireless module to acquire and record data remotely through wireless. With these flexible peripherals, temperature data can be captured and saved in real time easily for various applications.

2.4. Main Application

- Temperature calibrations or precision temperature measurements.
- Work with Standard Platinum Resistance Thermometers (SPRTs), secondary platinum resistance thermometers (Secondary PRTs) and precision industrial platinum resistance thermometers (IPRTs).
- Wireless/wire/flash real time temperature measurement and acquisition.

2.5. Main Features

- High accuracy, 0.008ºC at 0ºC.
- High resolution，0.001ºC
- Concurrent platinum sensor temperature measurement and data capturing.
- Concurrent display of sensor's temperature in Celsius ºC, ºF, resistance Ω.
- 2.7" large size OLED display.

- Touchpad for function control.
- Flexible sensor parameter adjustment and setting.
- USB interface to computer for real time temperature capturing and data saving.
- Wireless real time temperature data capturing with optional external wireless module.
- Real time temperature data capturing and saving to flash drive.

2. Main Specification

3.1. Main Specifications

- Range of temperature measurement：-200ºC ~ 850 ºC
- Instrument resolution：0.001 ºC
- Instrument accuracy：

25Ω standard platinum temperature sensor	100Ω standard or industrial platinum temperature sensor
±0.015 ºC @ -196 ºC	±0.010 ºC @ -200 ºC
±0.010 ºC @ 0 ºC	±0.008 ºC @ 0 ºC
±0.015 ºC @ 232 ºC	±0.009 ºC @ 232 ºC
±0.020 ºC @ 420 ºC	±0.01 ºC @ 420 ºC
±0.025 ºC @ 660 ºC	±0.015 ºC @ 660 ºC
	±0.025 ºC @ 850 ºC

- Instrument short term stability：
  - ±0.001 ºC（with 100Ω platinum sensor）
  - ±0.003 ºC（with 25Ω platinum sensor）
- Instrument working environment：15ºC ~ 35 ºC
- Power supply：AC 100V ~ 240V
- Power consumption：< 15 W
- Dimension ： 180 mm x 65 mm x 200 mm
- Weight ： 300g

3.2. Sensor Types

- SPRT or PRT with temperature coefficient α=0.003925 (WGa≥1.11807).
- IPRT with temperature coefficient α=0.00385.

3. User Interface

Front Panel:

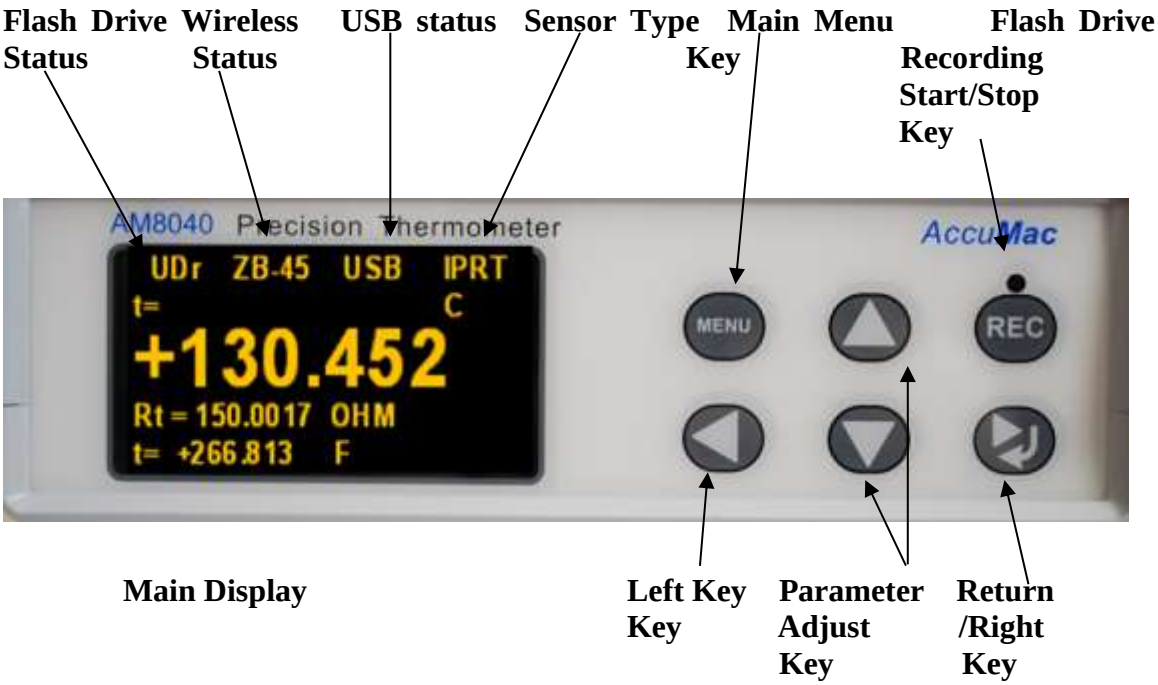


Figure 1: Front Panel

Rear Panel:

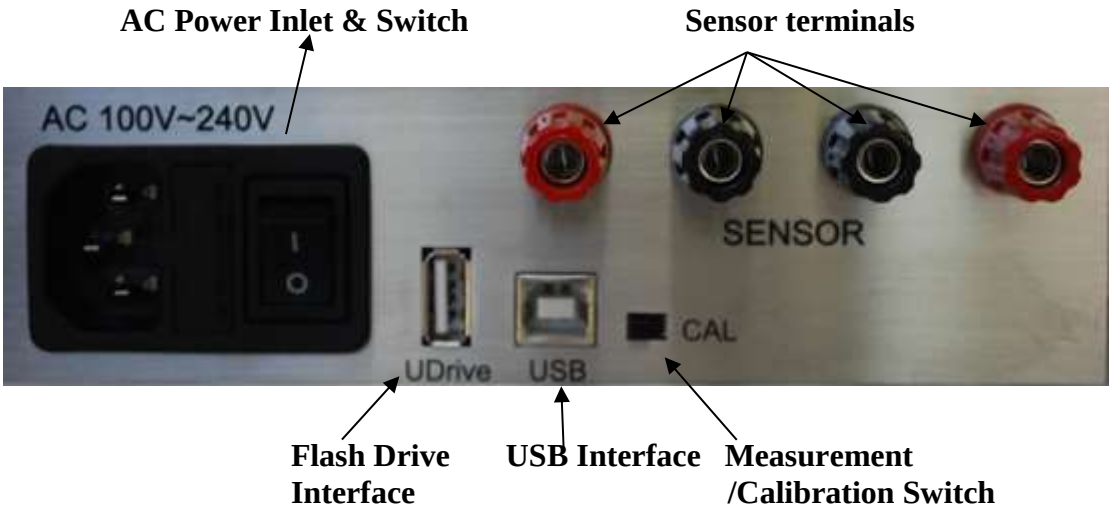


Figure 2: Rear Panel

Warning: Unless calibration is needed do NOT put the switch on 'Cal'.

4. General Operations

AM8040 is a high accuracy digital thermometer working with a four-wire platinum resistance thermometer (PRT) sensor.

The details of AM8040 operations are shown as follows:

5.1. Connecting the probe/sensor

Four-wire sensor should be connected to the "Sensor" terminals at the rear panel. Figure 3 shows how the four wire sensor should be connected.

It should be noted that the "Measurement/Calibration" switch should be at "Measurement" position.

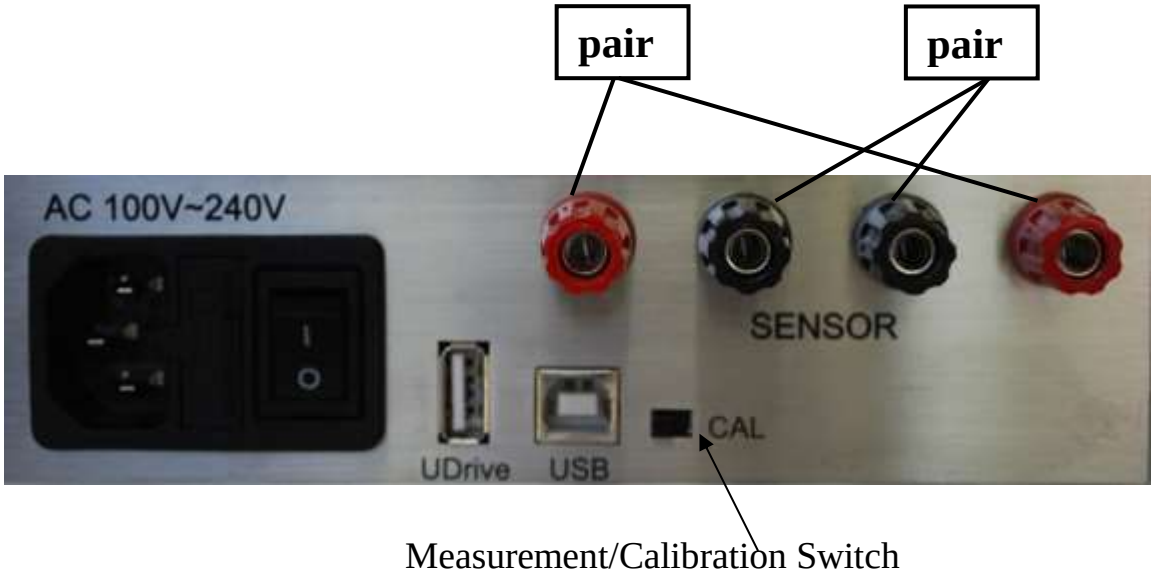


Figure 3: Rear Panel and Sensor Terminals

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5.3. Instrument front panel display and touchpad

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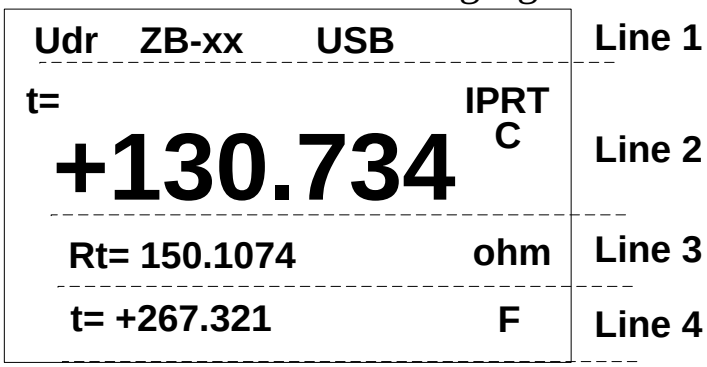

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The menu key

and return/right shift key can be used for sensor selections and parameter adjustments. The flash drive recording start/stop key

can be used for data saving to flash drive. The details are in 5 Instrument Calibration and Accuracy Adjustment, and 6 Selection of Sensors and Adjustment of Parameters.

5. Instrument Calibration and Accuracy Adjustments

AM8040 is designed for accurate temperature measurements by measuring the sensor resistance and converting it to temperature. Consequently, the resistance measurement is very critical and the instrument must be calibrated correctly. Every AM8040 is calibrated before shipment.

Users can calibrate AM8040 using standard resistors with calibrated values. One year calibration interval is recommended.

Warning: *It is required to set correct R0 or Rtpw value of the sensor before calibrations. To calibrate AM8040 in the range from 10 Ω to 50 Ω, R0 or Rtpw needs to be set to 25 Ω. To calibrate AM8040 in the range from 50 Ω to 375 Ω, R0 or Rtpw needs to be set to 100 Ω.*

The calibration should be done in an environment with room temperature of 22±2°C.

Instrument calibration procedure: (No special sequence for 100 Ω and 25 Ω calibrations)

6.1. 100 Ω calibration

5.1.1. Turn off the power, put the measurement/calibration switch to the "CAL" side (right side). Please see Figure 4 for details.

Figure 4: Calibration Configuration at Rear Panel.

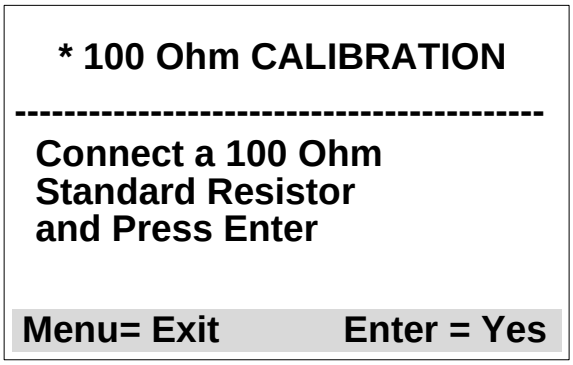
5.1.2. Turn on power, after initialization， AM8040 shows the calibration main menu. There are two calibrations selections: 100 Ohm CALIBRATION and 25 Ohm CALIBRATION. The following is an illustration of the 100 Ohm CALIBRATION.

```
* CALIBRATION MENU *
-----------------------------------------
>  100 Ohm CALIBRATION
   25 Ohm CALIBRATION

                        Enter = Yes
```

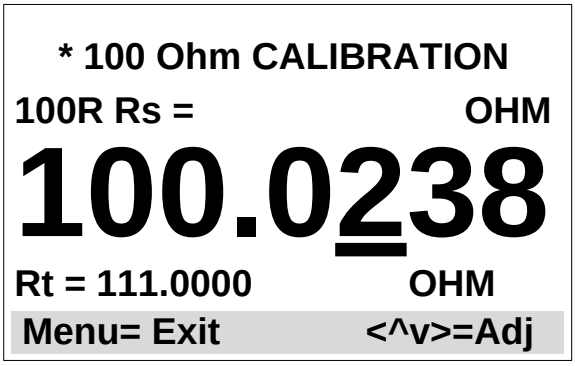
5.1.3. Use or key on the key pad to select the calibration. A ">" sign is displayed in front of the selected line. For example, the above figure shows that 100 Ohm CALIBRATION is selected.

Pressing the key will start the calibration program, and the following display will appear：



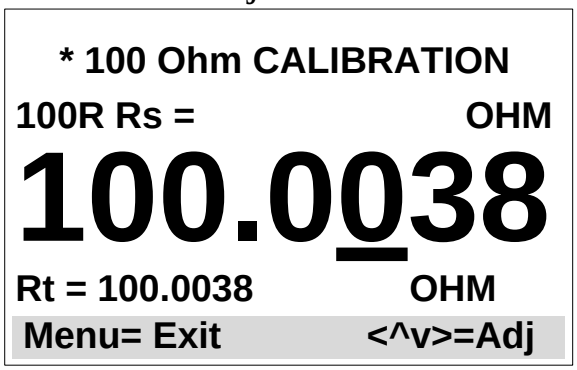
5.1.4. The instrument will show "Connect a 100 Ohm Standard Resistor and Press Enter" to indicate that a 100Ω must be connected first. Users can exit the calibration by pressing MENU key to go back to main menu (*CALIBRATION MENU*).

5.1.5. After the sensor is correctly connected, press key to start the calibration. The instrument will display "Waiting…" for a few seconds and should display some values as following：



5.1.6. To calibration the instrument, users must adjust the value at the third line (100.0238 as shown above) to match the standard resistor's resistance. For example, if the resistance of the standard resistor is 100.0038ohm, users can move the underline cursor to the position where the value will be adjusted by using and key,

and users can adjust the value by using ▽ and △ key. The following picture shows the adjusted result.



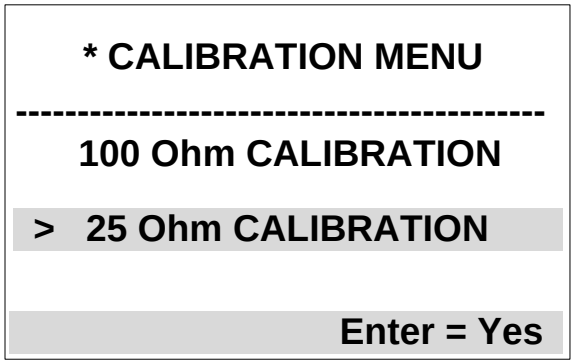
5.1.7. It is required to wait for 15 to 20 seconds before the data are stable. The next step is to save the calibrated data to the instrument. To save the data, press the MENU key, and the third line data will blink to inform the option to save.

5.1.8. To save this calibration value, press and hold the ◁ key and then press the ↵ key at the same time. This operation will store the calibration data to the instrument, and the program will go back to the main menu (*CALIBRATION MENU*). If users DO NOT want to save the data, press the MENU key and the display page will be back to main menu (*CALIBRATION MENU*).

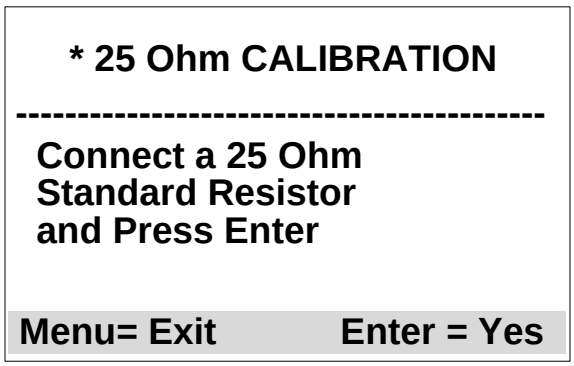
6.2. 25 Ω calibration

5.2.1. The process of 25 Ω calibrations is similar to that of 100 Ω Calibration. Frist, turning off the power of the instrument and ensure the measurement/calibration switch at the rear panel to the "CAL" side (right side), as shown in Figure 4.

5.2.2. Choose 25 Ohm CALIBRATION under main menu (*CALIBRATION MENU*) by pressing or key to move the ">" cursor to the "25 Ohm CALIBRATION" line：

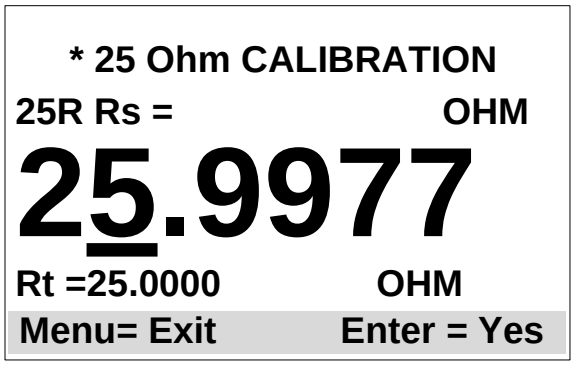


5.2.3. Press key to start the program of 25 Ohm CALIBRATION. The instrument will show：

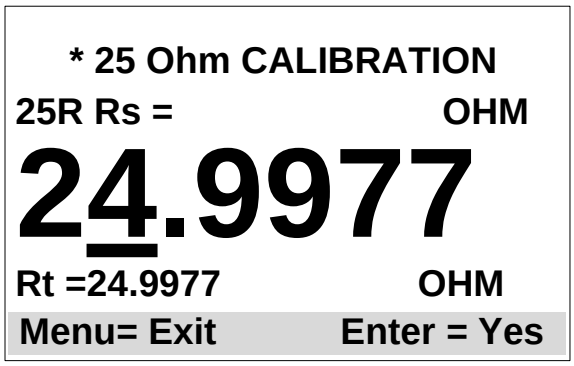


5.2.4. Follow the "Connect a 25 Ohm Standard Resistor and Press Enter" instruction to connect a 25Ω to sensor terminals. A standard resistor of 25Ω must have a value close the 25Ω; otherwise the calibration will not be accurate.

5.2.5. Press key to start the 25Ω calibration. the instrument should display "Waiting…" for a few seconds and then show：



The value on the third line is the parameter to be adjusted and this value must match the standard resistance of the 25Ω resistor. For example, the above figure shows the current value of 25.9977, but the standards resistor value is 24.9977. This value can be adjusted by using ◀ or ↵ key to move the "_" to the position where the value will be tuned, and using ▼ or ▲ key to adjust the value. After the adjustment, the instrument should display:



5.2.6. It is required to wait for 15 to 20 seconds before reading is stable. The next step is to save the calibrated data to the instrument. To start the data saving, press the MENU key, and the third line data will blink to indicate the option to save.

5.2.7. To save this calibration results, press and hold the ◀ key and then pressing the ↵ key at the same time. This will save the calibration data to the instrument, and the program will go back to the main menu (*CALIBRATION MENU*). If users DO NOT want

to save the data, press the MENU key and go back to main menu (*CALIBRATION MENU*).。

Switch setting after calibration

- **After the calibration, turn off the AC power ;**
- **Set the Measurement/Calibration switch at the rear panel to the left side (away from "CAL")**

6. Selection of Sensors and Adjustment of Parameters

AM8040 can work with different types of PRT probes/sensors. It allows users to select probe types and input the parameters of the probes.

The probes compatible with AM8040 are:

25 Ω or 100 Ω standard SPRTs, or
25 Ω or 100 Ω secondary reference PRTs, or
100 Ω IPRTs.

The temperature coefficient of these sensors can either be 0.00385 Ω/Ω/°C or 0.003925 Ω/Ω/°C.

The sensor types working with AM8040 are classified and named as IPRT and SPRT：

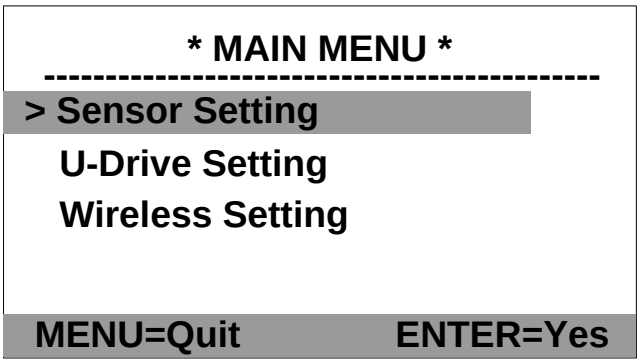
- *If the probe is an industrial or precision platinum resistance thermometer probe with a temperature coefficient of 0.00385 Ω/Ω/°C, AM8040 will categorize the probe as "IPRT". AM8040 calculates temperature according to CVD (IEC751) method.*

- *If the probe is a SPRT, or a secondary PRT with temperature coefficient of 0.003925 Ω/Ω/°C (W_{Ga}>=1.11807), AM8040 will categorize the probe as "SPRT". AM8040 calculates temperature according to ITS-90 formula.*

Steps to select sensor type and input parameters:

1. Under normal working state after power on, press

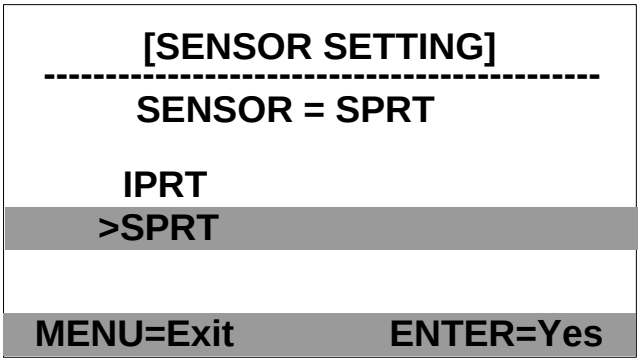
key and then press key in 3 seconds, AM8040 will go to the parameter adjustment main menu, and the display will show:



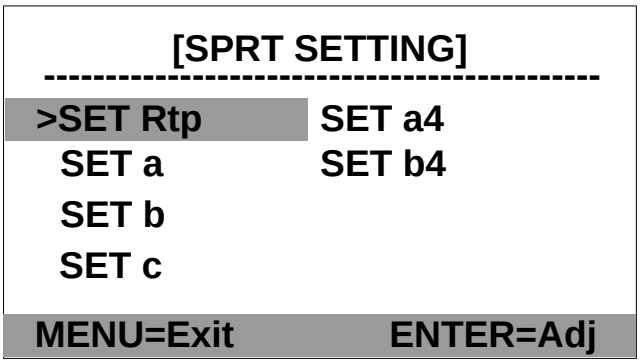
There are three options at this step:

i. Sensor Setting. This is for sensor parameter adjustments. Users can select sensor type and do parameter adjustment.
ii. U-Drive Setting. Users can select data saving rate to external flash drive.
iii. Wireless Setting. Users can select wireless communication settings (optional).

2. Press or key to move the high lighten line with ">" to "Sensor Setting". Press key to enter Sensor setting adjustment program as shown below. The sensor type can be "IPRT" or "SPRT". Users can select either one by moving the ">" to the sensor type, and then press key. Users can exit this selection screen by pressing MENU key. The figure below shows that SPRT sensor type is selected.



3. Press key is to go to parameter adjustment menu:

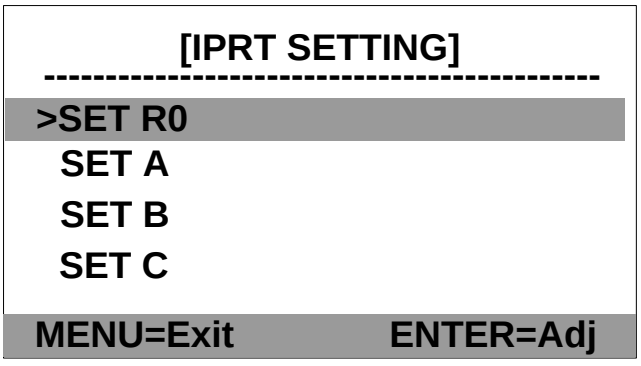


4. If the type of sensor is SPRT, the adjustable parameters are Rtp, a, b, c, a4 and b4. The details of these parameter definitions can be found from ITS-90.

   As an example, calibration agencies provide following parameters after SPRT is calibrated:

   Rtp: probe's resistance at triple point of water.
   a4 and b4： low temperature range parameters.
   a, b and c： high temperature range parameters (c can be "0" for some instances. Please refer to ITS-90 for more information.)

5. If the sensor type is IPRT, the adjustable parameters are R0, A, B and C.



   The details of the parameter definitions can be found from the industrial platinum resistance thermometer calibration procedure.

   As an example, calibration agencies provide following parameters after IPRT is calibrated:

R0：the sensor's resistance at 0°C.
A and B: the temperature coefficients when temperature is higher than 0°C.
C: the temperature coefficient when the temperature is lower than 0°C.

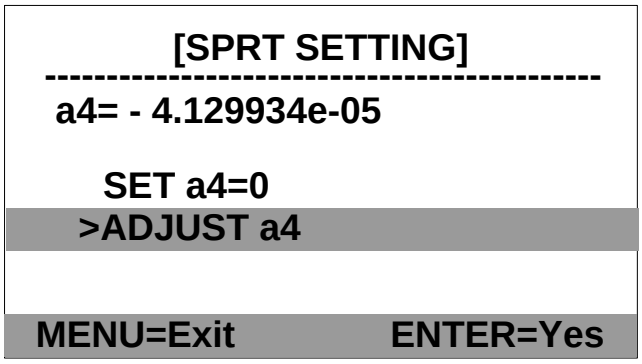
6. MENU, ▼, ▲, ◀ and ↵ key can be used together to adjust these parameters. The parameters can also be saved into the instrument. The following example is the procedure of adjusting and saving Rtp and a4 of a SPRT. The other parameter adjustments follow the same process.
   a. To adjust Rtp，continue the operation of 4, press ▼or ▲ key to move the cursor to ">SET Rtp", and then press ↵ key to go to Rtp adjustment program.

   b. The instrument will display the current Rtp value. The digit with bottom blinking bar indicates the adjustable position. Users can use ◀ and ↵ key to move this position and use ▼and ▲ key to adjust the value.

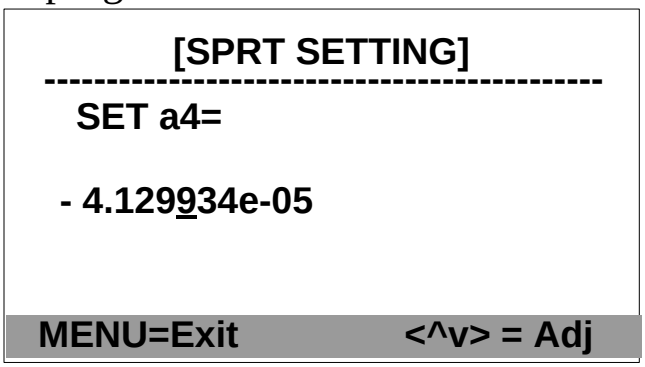
   c. After Rtp is adjusted, press MENU key. The display will remind users to save or not to save the adjusted value by flashing the adjusted Rtp. Press ↵ key to save the value or

press MENU key to exit the program without saving and go back to the parameter adjustment menu.

d. The following is the a4 adjustment procedure. Continue from 4, press ▼ and ▲ key to move the cursor to ">SET a4", and then press ↵ key to go to a4 adjustment program, as shown below:



The second line displays the current a4 value, and the next two lines show the adjustment selections. a4 adjustment is different from Rtp adjustment as the value of a4 can be "0". If a4 is "0", users can move the cursor by using ▼ and ▲ key to "SET A4=0" line and press the ↵ key to confirm the selection; if a4 is a value other than "0", user can move the cursor to "ADJUST a4" line and then press ↵ key to go to a4 adjustment program.



e. The current a4 value will be displayed. To adjust this value, press or key to move the underline cursor to the position where the value will be adjusted and then adjust it by moving or key.

f. After adjustment, users can choose to save or quit the a4 adjustment by pressing the key. The a4 line will be flashing to remind the user that a change has been made. To save the changes, press key; if not, press key and the program will go back to previous screen.

g. Other parameter adjustments are similar to the above Rtp and a4 adjustment.

h. After all the adjustments are made, users can go back to the main menu by pressing key multiple times until AM8040 go back to the main screen of measurement.

7. Wireless Data Acquisition

Some AM8040 precision thermometers (Model# AM8040-W) are equipped with wireless module to transmit data wirelessly. Free software for this feature is included with the AM8040-W. Following components are need for this feature:

- AM8040 precision thermometer with embedded wireless function.
- A wireless transceiver.
- A USB cable.
- Computer with USB interface and Windows XP (or above) operating system.

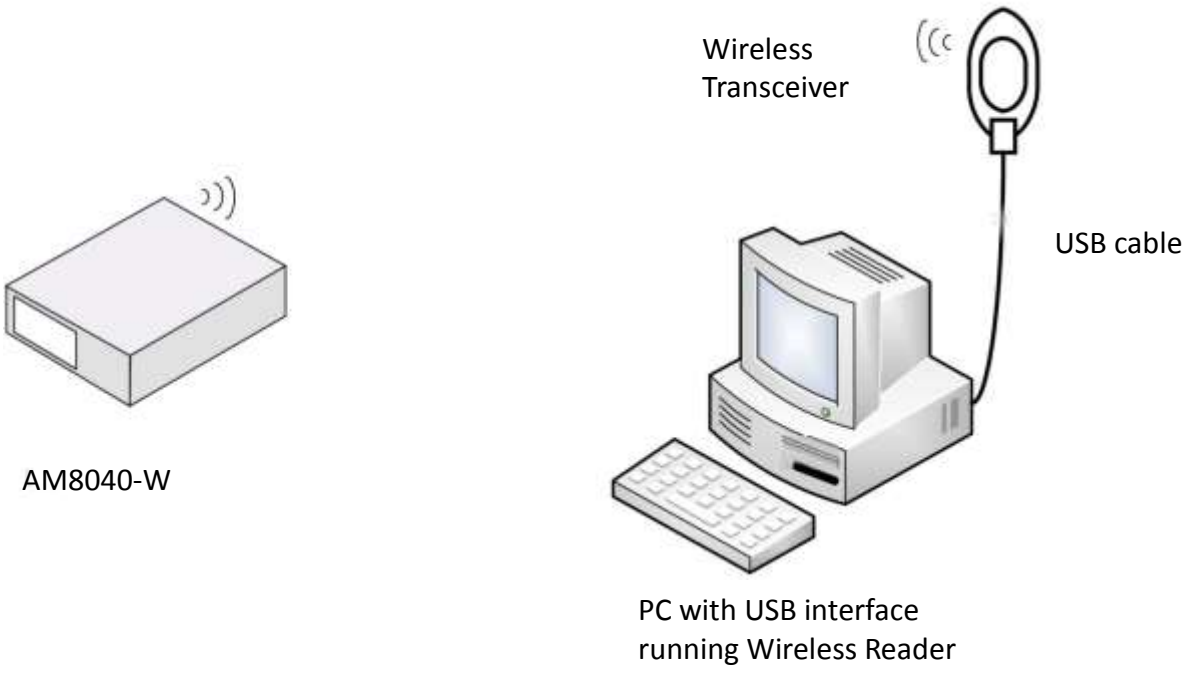


Figure 5: AM8040-W Wireless Data Acquisition.

Directions for setting up the wireless communication system:

1) The AM8040 precision thermometer must be on and connected to a probe.

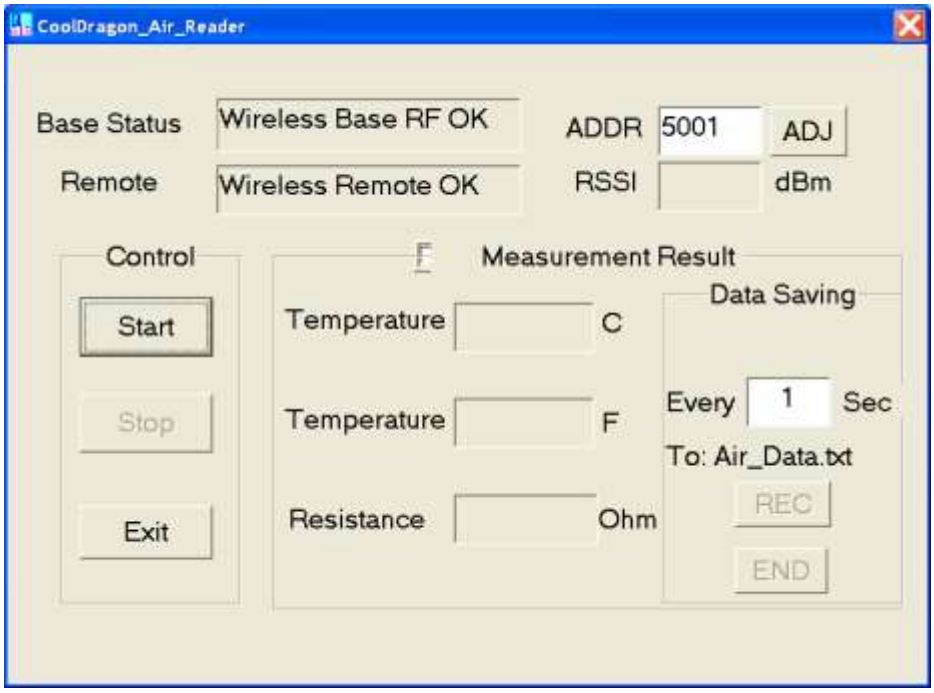
2) The computer and wireless transceiver must be within 50m (indoor) or 80m (outdoor) distance from AM8040. The computer must be powered on.

3) Connect the wireless transceiver to the computer with a USB cable. Place it at a high spot for best performance. The system setup is shown in Figure 5

4) After connecting the wireless transceiver to the computer, the user will be required to install the USB drivers. The detailed instructions for this are shown in the Appendix.

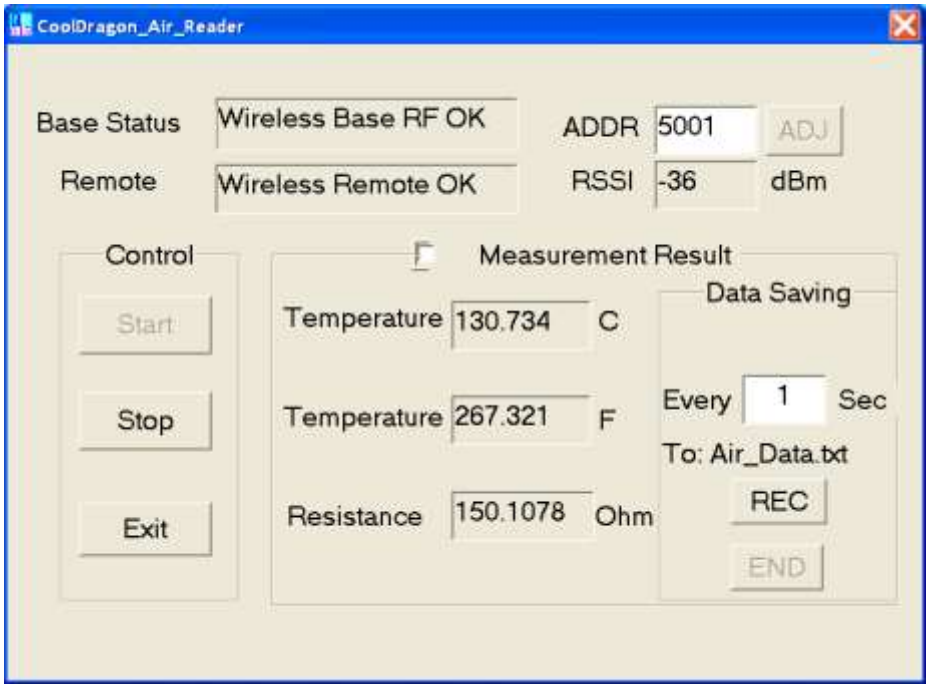
5) After the installation of USB drivers, the user will need to install the free software on the CD included with the AM8040. Insert the CD into the computer's CDROM drive and copy the file named "CoolDragon_Air_Reader.exe" to the computer.

6) Once the file has finished copying, double click on the icon "CoolDragon_Air_Reader" to begin installation. The following screen will display:



7) "The Base Status" and "Remote" should display "Wireless Base RF OK" and "Wireless Remote OK" to confirm the wireless connection. The value after "ADDR" shows the wireless address of AM8040 precision thermometer. The data after "RSSI" is the wireless signal strength which should be a two-digit number after clicking on "Start". The RSSI should be greater than -99dBm. Otherwise, the wireless signal is too weak and the link is not stable. To increase the wireless power, users can move the instrument closer to computer or increase the height of the Wireless Transceiver. If it is still too weak, the environment is not suitable for wireless communication.

8) To begin wireless data acquisition, clicking on "Start". If the wireless signal is good enough, AM8040 should display "ZB-xx" where "xx" means the wireless signal strength. At the same time, CoolDragon_Air_Reader should also show the signal strength. The following figure is an example.



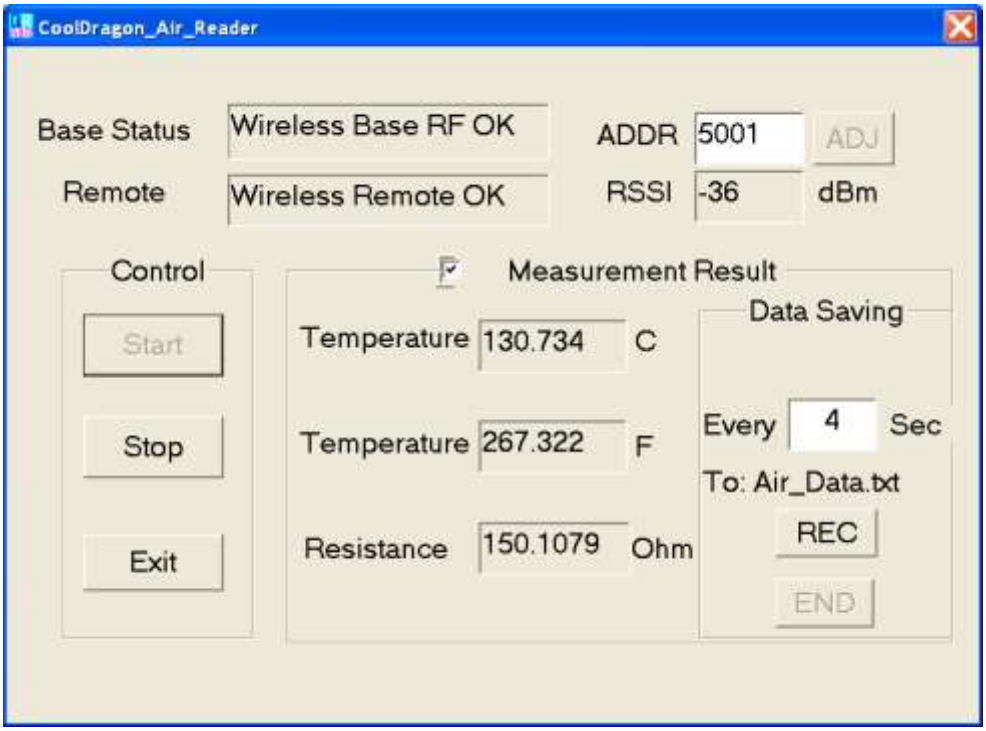
9) The wireless data acquisition can be halted by clicking on "Stop", or clicking on "Exit" to quit the program. The default setting for sampling period is 1 second. The data acquisition can be restarted by clicking on "Start" if "Stop" is pressed before.

10) CoolDragon_Air_Reader can also save the captured data to a file "Air_data.txt". The data sampling rate can be adjusted. The minimum sampling period is 1 second. Other data sampling period can be set by following the instruction.

As shown in the above figure, below "Data Saving" there is "Every x Sec" where x means the sampling period with unit of second. It is noted that this sampling period can be adjusted only when the sampling is stopped or halted. For example, if the sampling period in the above figure is required to change, the program must be halted by clicking on "Stop" button first, and then users can change the sampling period. The sampling period must be integer. The data sampling can be restarted after the modification.

If the captured data need to be saved, users can start the saving by clicking on "Start", and then clicking on "REC" button. The captured temperature can be saved into "Air_data.txt", and "Recording…" can be seen; if users want to stop data saving, clicking on "END" or "Stop", the temperature data capturing can be stopped.

The following is an example with 4 second period.



11) The data format saved in the file of Air_data.txt can be shown as following data:

```
Time        t(C)
12:10:12 +130.735
12:10:13 +130.735
12:10:14 +130.735
12:10:15 +130.735
12:10:16 +130.735
```

12:10:17 +130.735
end recording

Time t(C)
12:10:28 +130.735
12:10:32 +130.735
12:10:36 +130.734
end recording

The first column is the sampling time which should be same as the computer time. The second column lists the temperature, each time "Stop" is pressed, the data saving will be halted, and "end recording" will be added to the file. If users want to continue data saving, users can clicking on "REC", the new data will be added to the last line of the previous data. The above example illustrated that the data are stored two times: the first time is 1 second, the second time the sampling period is 4 seconds.

8. Using a Flash Drive（U disk）for Data Acquisition

The flash drive recording start/stop key REC can be used for saving data to the USB flash drive.

There is a USB port on the rear panel of the AM8040 which can be used to store the measured temperature data to a flash drive. Any flash drive with size lower than 4 gigabytes can be connected to the "UDrive" connector at the rear panel. The following steps explain how to transfer data from the AM8040 to a flash drive:

1) Connect a flash drive to the "UDrive" USB interface at the rear panel of AM8040.

2) After the flash drive is connected when AM8040 is powered on the display screen will show some quick information "Device Detected" "D:/p" to indicate that the flash drive is detected, and the upper left corner of the display should display "UDr" to remind users that a flash drive is connected and can be used for data capturing.

3) If the flash drive is connected before the power is on, AM8040 will show the quick information "Device Detected P2" during initialization to indicate that the flash drive is detected, and the left up corner of the display should display "UDr" to remind users that a flash drive is connected and can be used for data capturing.

4) If users want to save the temperature data measured by AM8040 to the flash drive, just press the REC key on the front panel， the AM8040 will produce a short beep sound and the LED above the REC will be turned on. This is to inform that the temperature data is being written to the flash drive. The file name that data is saving

to is with the name of MYDATA.txt with sampling period 0.97 second.

5) If users want to stop the data saving, just press REC key on the front panel，AM8040 will produce a short beep sound and the LED above REC key will be off to show the end of data saving.

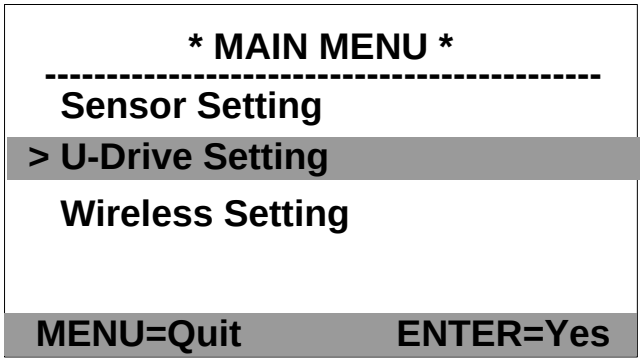
6) The following list is an example of data saved in MYDATA.txt file of the flash drive. The fist column is temperature in Celsius t(C); the second column is time with unit of second. An "end" is written to the file to show that REC key is pressed.
   i. t(C) Time
   ii. +267.178 0.24
   iii. +267.178 1.21
   iv. +267.178 2.17
   v. +267.178 3.14
   vi. +267.178 4.10
   vii. end

7) The above operations can be repeated to do multiple time data saving.

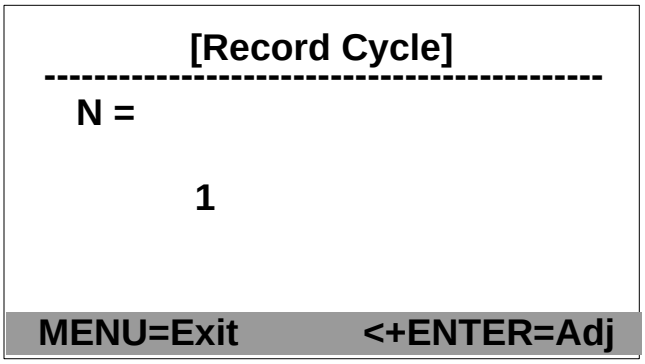
8) The temperature data file MYDATA.txt in the flash drive can be transferred to a computer. Just unplug the flash drive when it is in stopped status （the LED above the REC key is off）and plug the flash drive to a computer USB connector. After the flash drive is detected by the computer OS, users can do the file copy as normal.

   The data saving period to flash drive can be adjusted by using the front panel. The default saving period is around 0.97 second，and it can be set as multiple times of this value with range of 1~65535. The detailed instruction is shown as below:

A. When AM8040 is in a normal working state, press MENU key and then press ↵ key in 3 seconds, AM8040 will enter the main menu as below.



B. Press ▽ key or △ key to move the cursor line with ">" sign to " > U-Drive Setting", then press ↵ key to go to "Record Cycle adjustment" program as shown below. "N" represents the how often the temperature will be saved in multiple times of 0.97 second. The current value is "1".



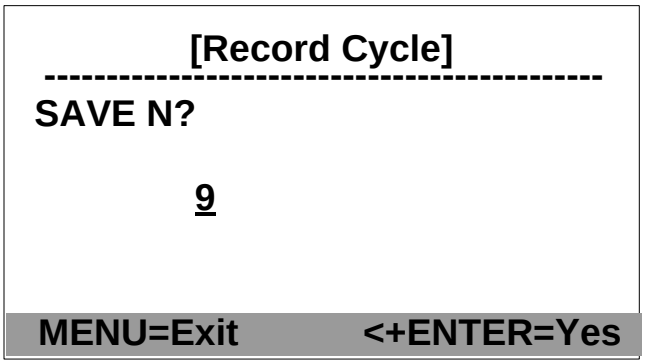
C. If sampling frequency other than "1" is needed, the "Record Cycle" value can be adjusted as follows: press and hold ◁ key and then press ↵ key, a similar display as below will come out.

- It should be noted that this operation is a two key operation. Don't release the ◁ key before pressing ↵ key.

D. Press key or key to adjust the "N" value which must be equal or greater than 1

E. After the adjustment, press MENU key, the new adjusted value will blink to indicate whether the user wishes to save this new N value. For example，the following picture shows the new N value is 9, which means AM8040 will save a data to file every 9x0.97 seconds. To save this value, do the following two-key operation: press and hold key and then press key；if users **DON'T** want to save, just press MENU key to exit.

- Note: this operation is a two-key operation： do not release key before pressing key. otherwise the new value can not be saved.



F. After the adjustment, press MENU multiple times until AM8040 goes back to main screen of measurement.

Note: The parameter adjustments should only be performed while the flash drive is not in the data saving process.

9. Using the USB Interface for Data Acquisition

AM8040 precision thermometer is designed with a USB interface for data acquisition and saving temperature data to a file.

The following section describes the process of setting up a USB temperature data acquisition:

1) Connect a USB cable to the USB (USB B type) interface at the rear panel of AM8040 to a computer.

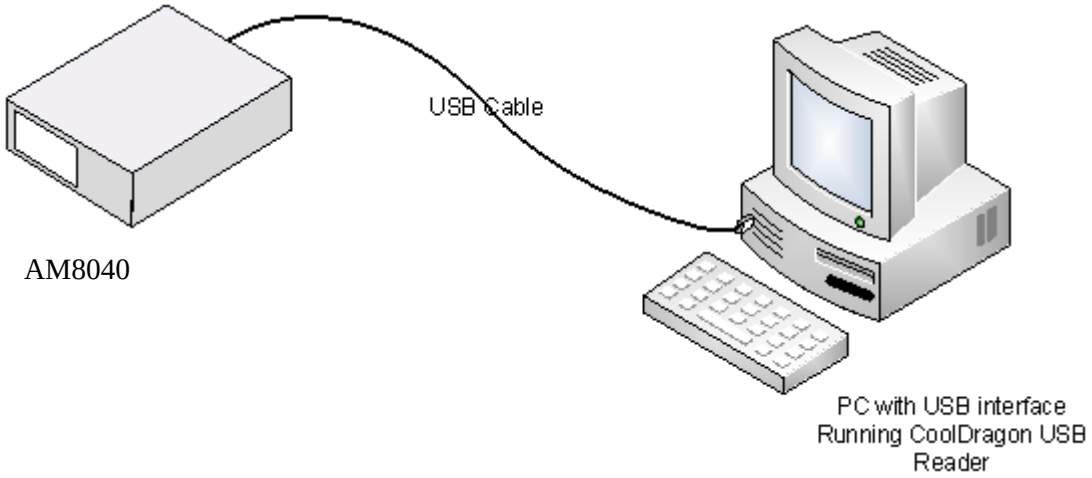
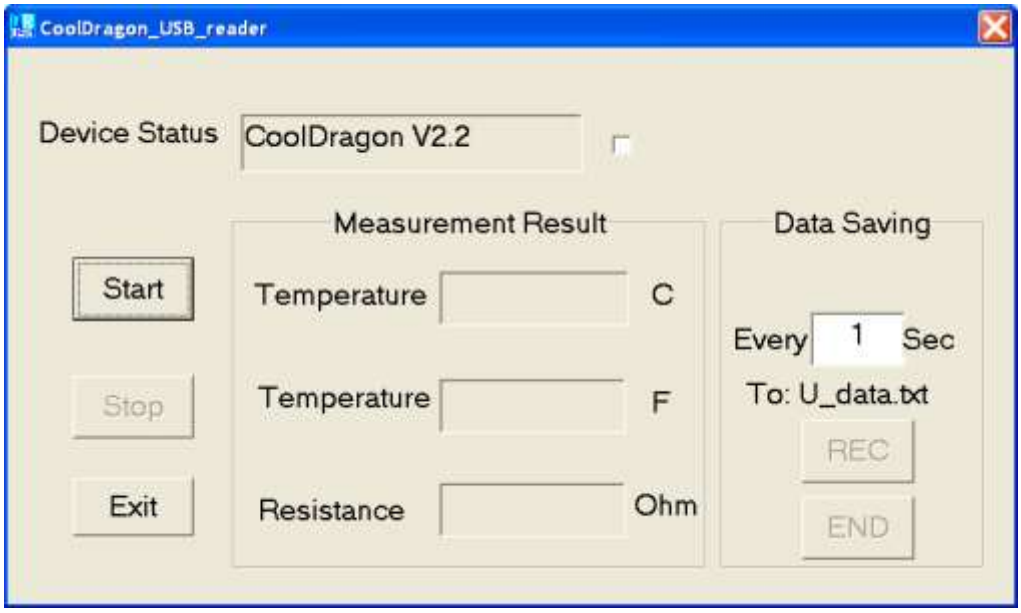


Figure6: AM8040 USB Temperature Data Acquisition System

2) The first time that an AM8040 is connected to a computer, the computer will require users to install the USB drivers. The detailed instruction is illustrated in the **Error! Reference source not found.**After the installation of these USB drivers, no further drivers will need to be installed.
   a. Copy "CoolDragon_USB_reader.exe" in the attached CD to the computer desktop.
   b. Double click on "CoolDragon_USB_reader" to start the software，the computer should show：



c. The measurement can be started by clicking on "Start", or can be stopped by clicking on "Stop", or quit by clicking on "Exit". The default sampling period is 1 second.

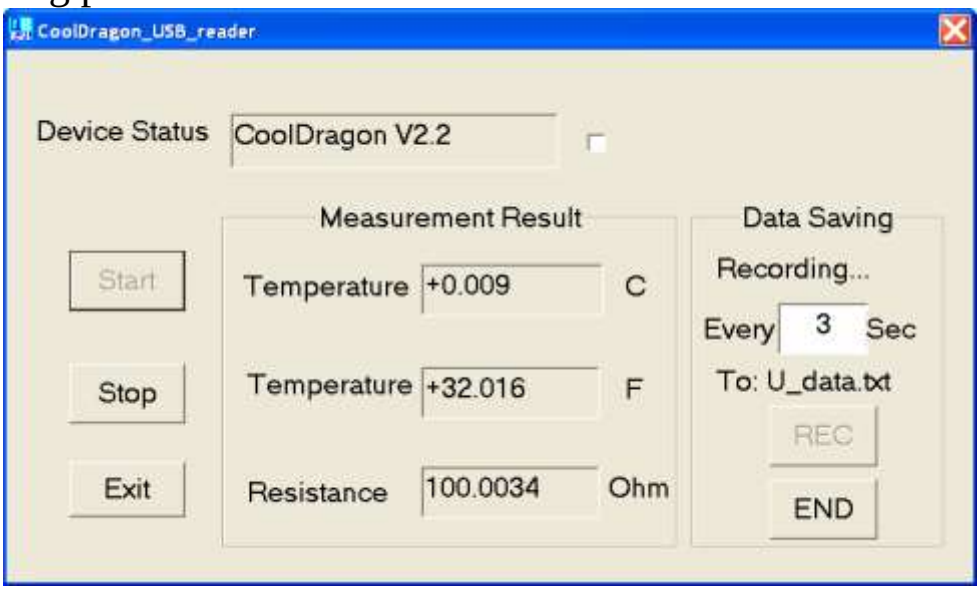
The free software "CoolDragon_USB_reader" also has data saving function to save the captured temperature to a file named "U_data.txt". Users can also adjust the sampling period for their requirements. The shortest sampling period is 1 second. The instruction is as follows.

Find the "Every x Sec" section of the "Data Saving" section at the right side of the software's GUI. The unit of the sampling period is second. If sampling period other than 1 second is required, users can adjust the value in the box. It is noted that the adjustment must be done when the measurement is "Stop" state as shown in the above figure, i.e., the adjustment must before "Start" or after "Stop" is pressed.

If users want to save the captured temperature data, click on "Start" first, and temperature data should be received with a blinking tick

showing the data capturing, then users can click on "REC" to start the data saving. The data will be saved to "U_data.txt" file， and "Recording…" should be shown； if users want to stop the data saving, just click on "END" or "Stop" , and the temperature data saving will be stopped.

The following figure shows that the data is saved to file with a sampling period of 3 seconds.



The saved data format in "U_data.txt" is like:

```
Time      t(C)
22:43:07 +0.009
22:43:10 +0.008
22:43:13 +0.008
22:43:16 +0.008
22:43:19 +0.009
22:43:22 +0.008
end recording
```

The first column is time which is identical to the computer time, and the second column shows the temperature.

10. Appendix: Installation of USB Driver

Important Update: if your PC is running Windows7 (or higher version) operation system, you can skip USB driver installation process. Otherwise, please follow the instructions below.

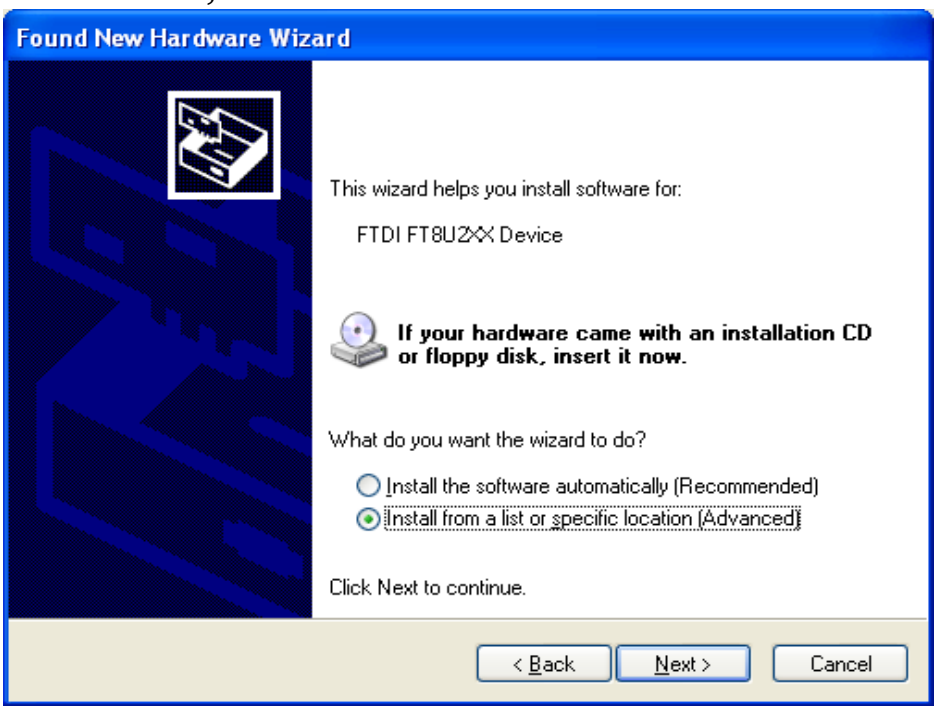
AM8040 precision thermometer and wireless transceiver are designed with USB interface. The installation of USB driver is required the first time these instruments are connected to a computer.

The USB drivers for AM8040 precision thermometer and wireless transceiver are the same. The installation can be done by following the steps below:

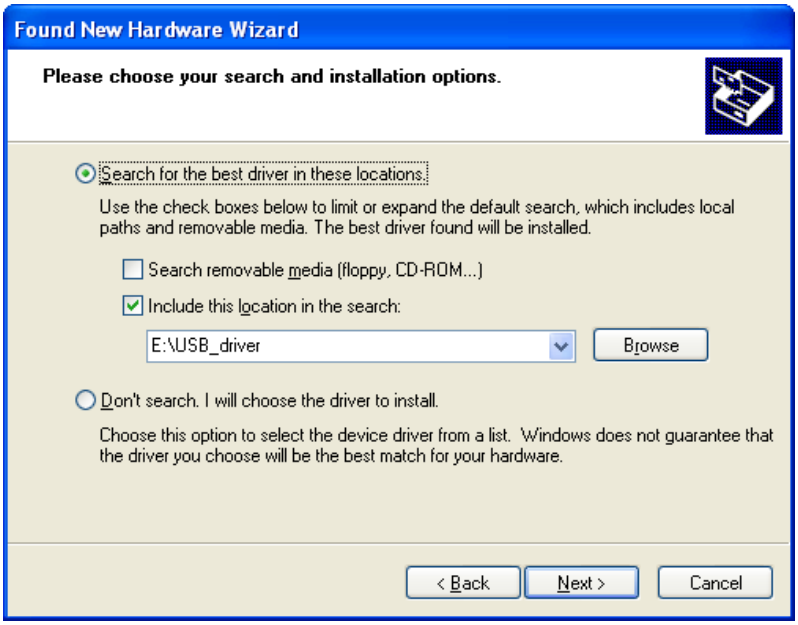
1) When AM8040 precision thermometer and wireless transceiver are first connected to a computer， OS will pop up an auto detection information "Found New Hardware" .

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

2) Put the attached CD into the CDROM drive (assume the CDROM drive is E:)，and then select "No, not this time" and click on "Next",


Found New Hardware Wizard
This wizard helps you install software for:
FTDI FT8U2XX Device
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

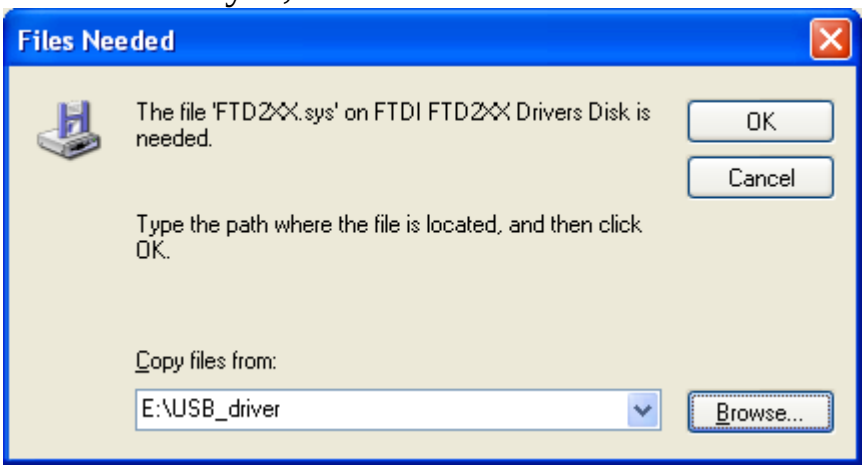
3) Select "Install from a list or specific location (Advanced)" and then click "Next",


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
E:\USB_driver
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

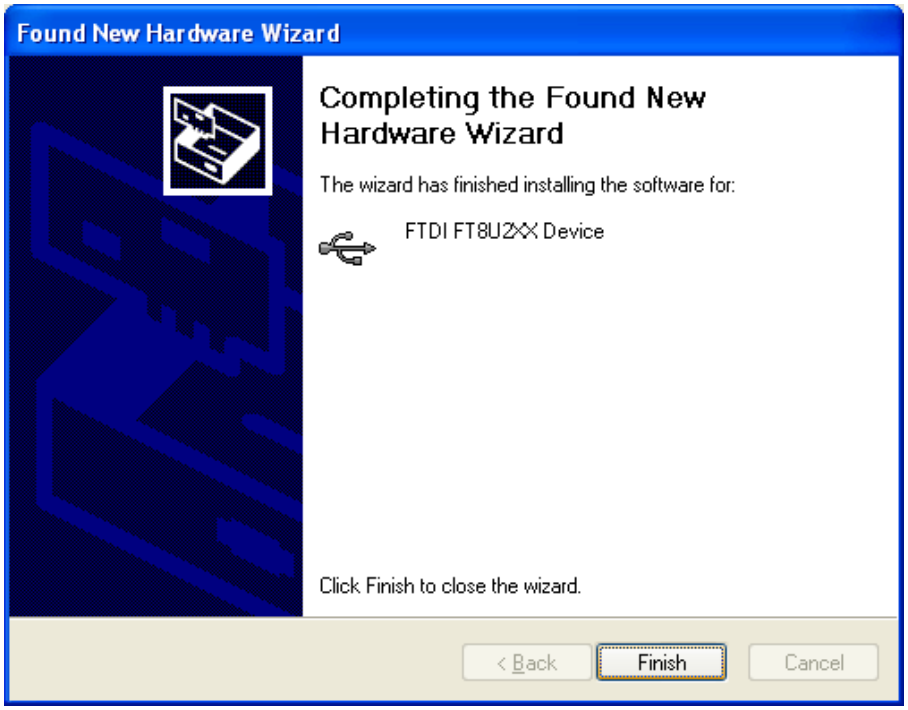
4) Search E drive by using "Browse" as above figure，then click "Next",

Hardware Installation
The software you are installing for this hardware:
FTDI FT8U2XX Device
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

5) Select "Continue Anyway", the computer will search for another file "FTD2XX.sys",



6) Use "Browse" to search for and select FTD2XX.sys，then click on "OK". After the installation, the computer should show：



7) Select "Finish" to end the installation.

8) The computer should show "You new hardware is ready to use" to indicate the USB drivers are correctly installed.

11. Limited Warranty & Limitation of Liability

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